

## NOCTURNAL FLIGHT CALL OF BICKNELL'S THRUSH

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**ABSTRACT.**—Audio recordings of nocturnal flight calls of migrating birds along the east-central Florida coast in May have documented calls that sound similar to those from Gray-cheeked Thrushes (*Catharus minimus*). Spectrographic comparison of these “Florida gray-cheeked” calls with Gray-cheeked Thrush calls recorded from Minnesota, southern Alabama, and west-central New York State shows that the Florida calls have distinctive acoustic features. Speculation that the “Florida gray-cheeked” calls are from the Gray-cheeked subspecies (*C. m. bicknelli*), now proposed as a separate species, Bicknell’s Thrush (*C. bicknelli*), is supported by spectrographic comparison with a diurnal Bicknell’s Thrush call and the coincidence of time and location of the “Florida gray-cheeked” recordings with the known timing and migration route of Bicknell’s Thrush. Received 21 Dec. 1992, accepted 6 May 1993.

Since Ball’s (1952) description of the nocturnal flight call (nf-call) of the Gray-cheeked Thrush (*Catharus minimus*), no progress in identifying the nf-calls of migrating passerines has been reported. However, nearly every fall migration summary in the “Audubon Field Notes” since the late 1950s contains one or more accounts of flight calls heard at night. This paper presents analyses of such calls.

### METHODS

Audio recordings were made on evenings when steady calling occurred throughout the following passerine migration seasons in the regions indicated; Minnesota (spring and fall 1987), southern Alabama (Oct. 1989 and spring 1990), west-central New York State (spring 1988 and fall 1988–1991), and east-central Florida (spring 1989 and 1991). The majority of these recordings, and those pertinent to this paper, were made with a Sennheiser 816T “shotgun” microphone with zeppelin windshield, a Shure FP-11 microphone pre-amp, and a Sony TCD-D10 digital audio recorder. A call-type’s presence or absence in a region was associated with known migrants for that area. Similarly, associations between call-types and species were deduced by comparing the dates when call-types were recorded with migration timing derived from historic diurnal observations in each region. In many cases, identification of an nf-call was supported by comparing it with a recording of an analogous diurnal call made by a visually-identified bird.

In the spring of 1989, audio recordings of nocturnal flight calls of migrating birds were made at Merritt Island National Wildlife Refuge (MINWR), 5 km east of Titusville, Brevard County, Florida. The recording effort began on 31 March and continued every evening through 6–7 May. In the early morning of 6 May, two nf-calls were recorded that sounded like those given by the Gray-cheeked Thrush, yet seemed to be different from Gray-cheeked nf-calls that had been recorded from other regions of North America. Because only two of these unusual calls were obtained, and it was known that *Catharus* thrushes have a fair amount of variation in their calls (Ball 1952), this impression lay dormant.

In the spring of 1991, audio recordings of nf-calls were again made in peninsular Florida.

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During the period 13–16 May, nf-calls were recorded from the Canaveral National Seashore north headquarters, 16 km southeast of New Smyrna, Brevard County, Florida. This location is approximately 30 km north of the MINWR location where recordings were made in 1989 and is approximately 100 m from the Atlantic Ocean. Over 10,000 nf-calls were documented during these three nights (8 hours of recording per night). Among these calls were 28, from an estimated 17 birds, believed to be those of Gray-cheeked Thrushes. Again, however, the aural distinctiveness that was noticed in 1989 was heard. Now, with a larger sample size, a consistent difference in the “gray-cheeked” nf-calls recorded in spring migration from east-central Florida was noted.

In looking for an explanation for the uniqueness and limited geographic distribution of the “Florida gray-cheeked” nf-calls, their resemblance to the nf-call of the Gray-cheeked Thrush led to the suspicion that they might be from a different Gray-cheeked subspecies. Range considerations directed the investigation toward the subspecies *C. m. Bicknelli* which has recently been proposed as a separate species, Bicknell’s Thrush (*C. bicknelli*) (Ouellet, 1993). Bicknell’s Thrush breeds in northeastern North America along the southern part of the north shore of the Gulf of St. Lawrence, in the mountains of the Gaspé Peninsula, and in the mountains of the northeastern United States. Its only known wintering ground is the mountainous islands of the Caribbean, primarily Hispaniola (Ouellet 1993). Migration records indicate that it uses the Atlantic coastal plain in transit between breeding and wintering grounds (Wallace 1939, Ouellet 1993).

The absence of the “Florida gray-cheeked” call-type in the author’s extensive recordings in fall migration from southern Alabama, Minnesota, and west-central New York State (Ithaca and Alfred areas) coincides with the fact that these locations are outside of the known fall migration route of Bicknell’s Thrush. Three Bicknell’s Thrush specimens have been collected in east-central Florida in spring (Wallace 1939) indicating that some portion of their population migrates through the region where the “Florida Gray-cheeked Thrush” nf-calls were recorded.

To support the Bicknell’s Thrush possibility, spectrographic analyses of nf-calls were performed at the Cornell Laboratory of Ornithology in the Bioacoustics Research Program. Recordings of all calls were converted into digital files using a “Macrecorder” analog-to-digital converter at a sampling rate of 22254 Hz. Spectrographic analysis was performed using the “Canary 1.0” software developed by the Cornell Laboratory of Ornithology’s Bioacoustics Research Program. Spectrographs of the digitized calls were made using a 512 pt FFT, 128 point frame size, 90% overlap, and Hanning window (frequency resolution = 21.7 Hz; time resolution = 5.75 msec; analysis bandwidth = 713 Hz).

## RESULTS

Gray-cheeked Thrush nf-calls were selected from each of the regions where extensive recording had been conducted (Minnesota, southern Alabama, and west-central New York) for comparison with the “Florida gray-cheeked” nf-calls. The number of nf-calls chosen from each region was limited to the number of calls of suitable amplitude for spectrographic analysis that were available. In cases where several loud calls seemed to be given by the same bird, only one of these nf-calls was used. Due to the altitude at which birds were often flying, most recordings were of insufficient amplitude to illustrate spectrographically the full contour of the call. For example, in Florida, while 30 “gray-cheeked” nf-calls were

recorded from an estimated 19 individual birds, nf-calls from only eight birds were of sufficient amplitude. From the other regions, though hundreds of Gray-cheeked nf-calls were recorded, only nine were suitable from southern Alabama, 17 from Minnesota, and eight from west-central New York State. In addition to the nf-calls, diurnal calls from Bicknell's and Gray-cheeked thrushes from Cornell Laboratory of Ornithology's Library of Natural Sounds (LNS) were spectrographically analyzed to see if diurnal calls of each species could be found that might help corroborate the nf-call identities.

The dominant structure of the eight "Florida gray-cheeked" nf-calls is a tone with a bandwidth of 0.5–1.0 kHz and a duration of 150–280 msec (Fig. 1A). The tone's time-frequency contour varies from an initial frequency of 1.5–2.0 kHz, through a rather steep ascent, so that within 10–20 msec, a frequency of 4.8–5.8 kHz is attained. From this point, the tone's frequency descends at a fairly uniform rate of between 6–8 Hz per msec. This uniform descent characterizes the greater portion of these nf-calls, and in at least the latter half of each call, a modulation frequency of between 120–150 Hz is evident. The initial rising section has a lower amplitude than the uniformly descending portion of the calls. Spectrographs of weakly recorded nf-calls lacked the initial rising section and showed only the uniformly descending structure.

The Gray-cheeked nf-calls from west-central New York State, southern Alabama, and Minnesota show relatively little variation between recording locations. These nf-calls are similar to the Florida Gray-cheeked Thrush nf-calls in their duration, bandwidth, and modulation frequency, but their time-frequency contours are distinctly different. Table 1 illustrates this by comparing the average frequency of certain common structural features in the nf-calls. The first frequency measurement point is at the highest frequency of the first "bend" in each call, a bend being a distinctive inflection in the slope of the call's time-frequency contour. The second frequency measurement point is the highest frequency that is greater than the first point in the call. In the case of the Florida Gray-cheeked Thrush nf-calls, there was no second frequency measurement since the first point was always the highest frequency in the call. The third frequency measurement point is the frequency at the end of the call.

The basic statistics for the frequency measures of the Gray-cheeked and Florida Gray-cheeked Thrush nf-calls demonstrate that these two groups of nf-calls are not similar (Table 1). The frequency of the first inflection point in the Gray-cheeked nf-calls averages more than 1 kHz lower than the first inflection in the "Florida gray-cheeked" nf-calls. Furthermore, the Gray-cheeked nf-calls average nearly 1 kHz lower than the "Florida gray-cheeked" nf-calls at the frequency where the call terminates.

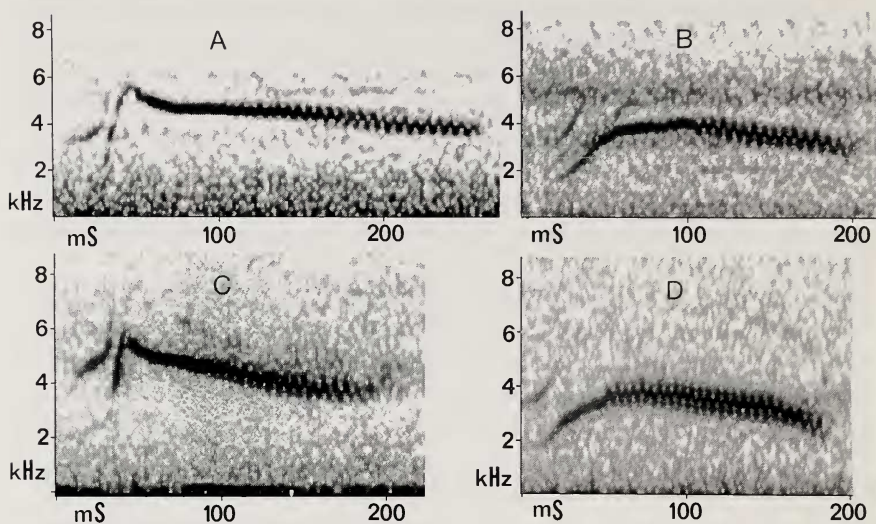


FIG. 1. Spectrograms of calls. Y-axis represents frequency in kilohertz (kHz). X-axis represents time in milliseconds (mS). (A) is a "Florida gray-cheeked" nf-call. (B) is a Gray-cheeked Thrush nf-call. (C) is a Bicknell's Thrush diurnal call. (D) is a Gray-cheeked Thrush diurnal call.

Besides the frequency domain differences, the two nf-call groups have characteristic shapes. The Gray-cheeked nf-calls have an arched (variably sloped) descent after the first inflection, while the "Florida gray-cheekeds" have a uniformly descending slope (Figs. 1A and 1B).

Another distinction, which aided in detecting the uniqueness of the "Florida gray-cheeked Thrush" nf-calls in the field, is that the modulation amplitude in the latter part of these calls averages 25–50% lower than in Gray-cheeked Thrushes. This makes the "Florida gray-cheeked Thrush" nf-call sound notably more pure-toned.

The Cornell Library of Natural Sounds contains several recordings of diurnal calls from each of these species. Among these recordings, an example of a diurnal call from a Gray-cheeked Thrush was found (Fig. 1D) that has frequency domain and shape parameters that match those of the Gray-cheeked nf-calls. This recording (LNS #4202) was made by A. A. Allen and P. P. Kellogg on 4 July 1954 at Churchill, Manitoba. It shows the characteristic "arched" shape of the Gray-cheeked nf-calls, and its highest frequency point (4.0 kHz) and ending frequency point (2.8 kHz) are also concordant.

Among the Bicknell's Thrush recordings at LNS, a diurnal call was found (Fig. 1C) that has frequency domain and shape parameters that

TABLE 1  
AVERAGE FREQUENCIES (kHz) OF COMMON STRUCTURAL POINTS IN THE NF-CALLS FROM EACH REGION

Location	Frequency points <sup>a</sup>		
	1	2	3
New York State (8 nf-calls)	3.6 (0.21)	4.0 (0.15)	2.5 (0.19)
Minnesota (17 nf-calls)	3.6 (0.25)	4.2 (0.18)	2.8 (0.33)
Alabama (9 nf-calls)	3.9 (0.10)	4.1 (0.11)	2.8 (0.21)
Florida (8 nf-calls)	5.3 (0.29)	—	3.7 (0.29)

<sup>a</sup> SD in parentheses.

match those of the "Florida gray-cheeked" nf-calls. This recording (LNS #4208) was made at Mount Mansfield, Vermont, on 29 June 1953, also by Allen and Kellogg. It has both the initial high frequency peak (5.7 kHz) and high ending frequency (3.8 kHz) characteristic of the "Florida gray-cheeked" nf-calls as well as the uniformly descending similarity.

Furthermore, although just a few diurnal recordings of each species were available, no diurnal Gray-cheeked calls had frequency domain and shape parameters that matched those of the Bicknell's nf-calls. Similarly, no Bicknell's diurnal calls were found that had frequency and shape parameters matching those of the Gray-cheeked nf-calls.

#### DISCUSSION

Range considerations strongly favor the Manitoba diurnal Gray-cheeked call as well as the Minnesota Gray-cheeked nf-calls to be from the subspecies *C. m. aliciae* (Wallace 1939, Ouellet, 1993). The similarity of the Gray-cheeked nf-call subsets from New York and Alabama to the one from Minnesota, as indicated in Table 1, suggests that these nf-calls could also be from *C. m. aliciae*. Nf-calls from the subspecies *C. m. minima* could be involved if they are similar to those of *C. m. aliciae*; however, nothing is currently known about their nf-calls. It is intriguing that a large sample of nf-calls from east-central Florida during the spring migration period of the Gray-cheeked Thrush did not yield a single "aliciae-type" Gray-cheeked Thrush nf-call.

Range considerations have been mentioned which make Bicknell's Thrush a likely migrant in east-central Florida. Also, the time of year that the "Florida gray-cheeked" calls were recorded compares favorably with Bicknell's known migration timing based on collected specimens. An overview of the relatively few specimen records that exist show that the dates they were collected are coincident with the timing of the "Florida

gray-cheeked" nf-calls. Wallace (1939) lists eight specimens that are unquestionably Bicknell's Thrush taken from Florida to North Carolina between 3-18 May. Sight records of ten Gray-cheeked Thrushes (not identified as to subspecies) in Brevard County, Florida, with dates ranging from 6 May to 22 May have been reported (Cruickshank 1986). No published records were found that contradict the possibility, based on migration timing, of the "Florida gray-cheeked" nf-calls being those of Bicknell's.

It is evident from reading Ball's (1952) work that he speculated on, and even had a strong hunch about, the nf-call of Bicknell's Thrush. The phonetics he used to describe the nf-calls he heard in late September of 1948, that he speculated might be from Bicknell's Thrush, were "cree-e-e" (Ball 1952:52). This is different from phonetics like "pe-i-i-i-r", "cheerrr", and "whe-errr" that he, and others, have used to describe the nf-call of the Gray-cheeked Thrush. Three types of phonemes are usually used to represent Gray-cheeked's nf-call. Because the high frequency point is near the middle of the call, the initial lower frequency part of the call is perceived and this, in turn, helps distinguish the higher frequency in the center of the call. Because of the ensuing frequency drop from the middle to the end of the call, the call is perceived to change in pitch from low to high to low, and this pattern is represented most accurately by three types of phonemes.

With the "Florida gray-cheeked" nf-calls, the characteristic abrupt frequency rise at the beginning of the call is so fast and of relatively weak amplitude that it is not easily distinguished by the human ear. The call sounds as if it changes in pitch from high to low, with the bulk of its duration a mild, uniform descent which is characterized best by repeating one type of phoneme. Since no phoneme is needed to represent an initial lower frequency part of the call, only two types of phonemes are needed, and there is no need for an "r" at the end of this nf-call's phonetic representation. Indeed, Ball's "Cree-e-e" fits the "Florida gray-cheeked" nf-calls well.

Ball tried to distinguish the nf-call of Bicknell's Thrush in a region where both Bicknell's and Gray-cheeked Thrush were migrants. His respect for potential variations in thrush nf-calls made certainty in the identity of Bicknell's nf-call difficult to obtain. The author was aided in abstracting nf-calls believed to be from Bicknell's Thrush by having learned and sampled the variations of the nf-call of Gray-cheeked Thrush in Minnesota, where Bicknell's Thrush is not a migrant. This allowed the pure sample of higher pitched and more pure-toned "gray-cheeked" nf-calls from east-central Florida to stand out.

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